

Unless otherwise stated, all work should be done algebraically, all work should be shown, and answers should be simplified.
No formula sheets or note cards are allowed for use during the final exam.

Objectives are from the course outline. Problems here are in the order as presented there.

You may want to work some core 1-5 objective problems last, so they are freshest going into the final exam.

[Core Objective 1, Sec 7.1, 7.2, 3.4, 3.5] (Slope-intercept form: $y = mx + b$)

1. Write the equation of the line that contains the points $(-2, -3)$ and $(0, 3)$, in slope-intercept form.
2. Write the equation of the line that contains the points $(-7, -4)$ and $(0, -6)$, in slope-intercept form.

[Core Objective 2, Sec 7.1, 3.2, 3.3, 3.5]

3. Graph $y = \frac{1}{3}x - 2$
4. Graph $x = -3$
5. Graph $4x + 3y = 12$

[Core Objective 3, Sec 8.1, 8.2, 8.3]

Solve each of the following systems of equations using any appropriate method: graphing, substitution, or addition (a.k.a. elimination). (Classify each system as consistent or inconsistent and as dependent or independent.)

6. $8x - 2y = 10$
 $-3y - 4x = -17$
7. $7x - 4y = 6$
 $y = 3x - 2$

[Core Objective 4, Sec 11.1, 11.2]

Solve. Give exact solutions. Write answers in simplest form.

8. $y^2 - 8 = 4y$
9. $x(6x+2) - 3 = 0$

[Core Objective 5, Sec 2.4, 2.5, 2.6, 2.7, 5.7, 6.7, 7.2, 7.6, 8.4, 9.5, 10.1 - 10.7, 11.1, 11.2, 11.4, 11.5]

Show all steps of the flowchart: i) familiarize, estimate, ii) assign labels to unknowns: $x =$ (what words), $y =$ (what words), create a Table, draw a sketch, iii) verbal model (write an equation/system/inequality in words), iv) mathematical model (write an equation, system of equations, or an inequality in algebraic expressions), iii) solve, iv) interpret: a) check that you've solved all parts, that the solution(s) make sense, and b) state the answer exactly (and if irrational, also approximate to three decimal places) in words (as a complete sentence).

10. (2.6) The perimeter of a rectangular garden is 24 ft. The length is 2 ft more than the width. Find the length and the width of the garden.
11. (2.8) To earn an A in a math class, Alsha must average at least 90 on all her tests. Suppose Alsha has scored 79, 86, 93, 90, and 95 on her first five math tests. Determine the minimum score she needs on her sixth test to get an A in the class.
12. (6.7) Tim and Al are bricklayers. Tim can construct an outdoor grill in 5 days. If Al helps Tim they can build it in only 2 days. How long would it take Al to build the grill alone?
13. (7.2) The average amount of time per year that a person in the United States spent reading newspapers decreased between 1994 and 1999.
Let x represent the number of years since 1994 (i.e., $x = 0$ corresponds to 1994). Let y represent the average time (hours) spent reading newspapers. (Source: Veronis, Suhler & Associates Inc., "Communications Industry Report.")
The graph of this data contains the two points: $(0, 169)$ and $(5, 156)$.
 - a. Find a linear equation that represents the time spent reading newspapers versus the year.
 - b. Use the linear equation found in part (a) to estimate the amount of time spent reading newspapers in the year 2000.
14. (7.6) The frequency of a vibrating string varies inversely as its length. A 24-in. piano string vibrates at 252 cycles/sec. What would be the frequency of an 18-in. string?
15. (2.7 & 8.4-system, total-value table) 282 people attended a recent performance of Cinderella. Adult tickets sold for \$5 and children's tickets sold for \$3. Find the number of adults and the number of children that attended the play if the total revenue was \$1046.
16. (8.4-system, % mix table) How much 45% disinfectant solution must be mixed with a 30% disinfectant solution to produce 20 gal of a 39% disinfectant solution?

[Core Objective 5 - Continued, Sec Sec 2.4, 2.5, 2.6, 2.7, 5.7, 6.7, 7.2, 7.6, 8.4, 9.5, 10.1 - 10.7, 11.1, 11.2, 11.4, 11.5]

17. (8.4-system, D=RT table) It takes a boat 2 hr to go 16 miles downstream with the current, and 4 hr to return against the current. Find the speed of the boat in still water and the speed of the current.
18. (10.3-Pythagorean Th.) Linda is at the beach flying a kite. The kite is directly over a stand castle 60 ft away from Linda. If 100 ft of kite string is out (ignoring any sag in the string), how high is the kite. (Assume Linda is 5 ft tall). (See Figure pg 680 of Miller.)
19. (11.1) Ignoring air resistance, the distance, d (in feet), that an object travels in free fall can be approximated by $d(t) = 16t^2$, where t is the time in seconds after the object was dropped. If the CN Tower in Toronto is 1815 ft high, how long will it take an object to fall from the top of the building? (State it exactly and round to three decimal places.)
20. (Ch 11 Test) The base of a triangle is 3 ft less than twice the height. The area of the triangle is 14 ft^2 . Find the base and the height. (State each exactly and round to the nearest thousandth of a foot (three decimal places).)

[Core Objective 6-1, Sec 2.1, 2.2, 2.3]

21. Solve. $3(r - 6) + 2 = 4(r + 2) - 21$

[Core Objective 6-2, Sec 2.4, 2.5, 2.6, 2.7].....See problems 10, 11

[Core Objective 6-3, Sec 3.2, 3.3, 3.5]See problems 3, 4, 5

[Core Objective 6-4, Sec 10.2, 4.1, 4.2, 4.3]

22. True or false (show a reason) $8^{-2/3} = -2^2$

Use the laws of exponents to simplify. Write the answer with positive exponents.

23. $\frac{(x^3 y^2)^{1/4}}{(x^{-5} y^{-1})^{-1/2}}$ 24. $(-5a^2 b^9)^0$

[Core Objective 6-5, Sec 5.1, 5.2, 5.3, 5.4, 5.5, 5.6]

25. True or false (show a reason) $x^2 + y^2 = (x + y)^2$

Factor completely

26. $2x^2 - 4x + 2$ 27. $25t^2 - m^2$

[Additional Content Objective 1, Sec 2.8, 9.1]

28. Solve the inequality. Graph the solution set on a real number line. State the solution set in interval notation.

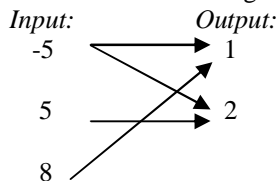
$$-7 - 5x < -22$$

Solve each compound inequality. Graph the solution set on a number line. State the solution set in interval notation.

29. $-2x \leq -4$ or $5x - 20 \geq 5$ 30. $-5 \leq \frac{x+1}{4} < -2$

[Additional Content Objective 2, Sec 7.3, 7.4, 7.5, 9.4, 10.1, 11.4, 11.5]

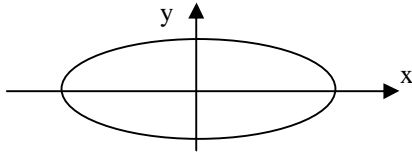
31. Given $f(x) = 2x^2 - 3$, Find the function value. $f(-3)$
32. Given $f(x) = \sqrt{x - 2}$, find the indicated function values, if possible: $f(0)$, $f(11)$.
33. Find the domain and range of the relation. (State them in set notation.) Also determine whether the relation is a function.



34. Determine whether the relation is a function. $x = 2y^2$

[Additional Content Objective 2, Sec 7.3, 7.4, 7.5, 9.4, 10.1, 11.4, 11.5]

35. True or false (show a reason): The relation graphed below is a function.

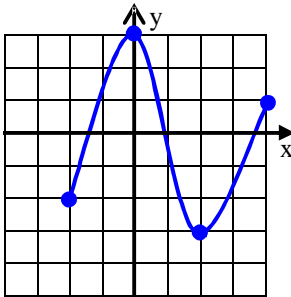


36. Find the domain (show work, 7.4B). (State it in set-builder notation.) $g(x) = \frac{x+1}{x^2-9x-10}$.

37. Find the domain (show work) and range (see also #40 & # 86). State them in interval notation. $f(x) = \sqrt{x-2} + 3$

38. Find the domain and range (see #42). State them in interval notation. $f(x) = x^2 - 6x + 12$

39. Find the domain and the range for function f graphed here. State them in interval notation.



[Additional Content Objective 3, Sec 7.1, 7.5, 9.4, 10.1, 11.4, 11.5]

Graph. (Plot *at least* 5 points for non-linear functions.)

40. $f(x) = \sqrt{x-2} + 3$

Find (and label) the vertex and sketch (and label) the line (axis) of symmetry. Determine whether the graph opens upward or downward. Find *any* intercepts. Graph the function. (Plot *at least* 5 points.)

41. $f(x) = -2(x-2)^2 + 6$ 42. $f(x) = x^2 - 6x + 12$

[Additional Content Objective 4, Sec 9.5]

43. Graph the solution of the system of inequalities (on graph paper). Find (and label) the coordinates of any vertices formed.

$$\begin{cases} x + 2y < 3 \\ -2x \leq y \end{cases}$$

[Additional Content Objective 5, Sec 10.1, 10.2, 10.3, 10.4, 10.5, 10.6]

44. Simplify. Assume that variables can represent *any* real number. $\sqrt{169x^{10}}$

Perform any operations and simplify (rationalize denominators). Assume that all variables represent positive real numbers.

45. $9\sqrt{50} + 4\sqrt{2}$ 46. $\frac{7\sqrt{2} + 4\sqrt{3}}{4\sqrt{3} - 3\sqrt{2}}$ 47. $\frac{\sqrt[3]{3x^4}}{\sqrt[3]{7y^2}}$ 48. $\frac{6+3\sqrt{6}}{6-3\sqrt{6}}$

[Additional Content Objective 6, Sec 5.7, 11.1, 11.2]

Solve

49. via factoring: $x^2 - 5 = 4x$

50. via square roots property: $-2(x-2)^2 = -6$

51. via completing the square: $x^2 - 6x + 12 = 0$

52. via the quadratic formula: $x^2 = 3x$

[Additional Content Objective 7, p 41, p 50, p 63, p 73, p 198-199, p 209, p 231, p 252, p 271, p458, p478, p486, p490, p522-523, p659, p661, p662, p 703, p746, p770, p 478, p 846]

Evaluate each of the following on a TI-82/83/84, if possible. State the result the calculator shows *exactly*.

53. $(-2)^{-4}$ 54. $1.5^2 + \sqrt{9-5} - |-5+2|$ 55. $\sqrt{-\frac{1}{16}}$

56. $\frac{6+3\sqrt{6}}{6-3\sqrt{6}}$ 57. $-5-2\sqrt{6}$ 58. $8^{4/3}$

59. Find the quotient, if possible on a TI-82/83/84. State the full result the calculator shows *exactly*.

$$\frac{10}{5-5}$$

Graph the following equations/functions on a TI-82/83/84. Do all the following as part of that process.

- a) State your grapher model number (TI-82/83/84, etc.)(once).
State precisely the sequence of keystrokes that you use as directed in each part below.

Circle or box each key-name you write, e.g., $\textcircled{\text{XT}\Theta}$ or $\textcircled{\text{MATH}}$ or $\textcircled{x^2}$.

- b) For *each* equation/function – state all keystrokes used to enter that function in the $Y_1=$ line.
c) State how you view a basic centered (“standard”) graph of any equation/function (once).
d) State how to view a t-table of any equation/function (once).
e) If in a “lecture” or hybrid section, you may be asked to show your instructor the graph while it’s displayed on your grapher.

(Note: You may need to solve for $y = mx + b$ form first.)

60. $y = \frac{1}{3}x - 2$ 61. $y = -2$ 62. $4x + 3y = 12$ 63. $f(x) = -2(x - 2)^2 + 6$
64. $f(x) = x^2 - 6x + 12$ 65. $f(x) = \sqrt{x-2} + 3$ 66. $f(x) = |x| - 2$

Find the solution of each system of equations below by graphing both lines of the system on a graphing calculator and finding their intersection. Do all the following as part of that process.

- a) State your grapher model number (TI-82/83/84, etc.)(once).
State precisely the sequence of keystrokes that you use as directed in each part below.

Circle or box each key-name you write, e.g. $\textcircled{-}$ (negative) or $\textcircled{(}$ or $\textcircled{)}$ (paren.) or $\textcircled{\text{XT}\Theta}$

- b) For *each* equation in a system – state all keystrokes used to enter that equation in a $Y=$ line (include which line it’s in).
c) State precisely the sequence of keystrokes you use to view the intersection point of a system (once).
d) If in a “lecture” or hybrid section, you may be asked to show your instructor the graph with intersection point while it’s displayed on your grapher.

(Note: You may need to solve for $y = mx + b$ form first.)

67.
$$\begin{cases} 8x - 2y = 10 \\ -3y - 4x = -17 \end{cases}$$
 68.
$$\begin{cases} 7x - 4y = 6 \\ y = 3x - 2 \end{cases}$$

[Other problem types which are highly likely to appear on final]

[Sec 7.1]

Find the equations of the lines that have the given characteristics. Write all answers in slope-intercept form.

69. Through the points $(-2, -3)$ and $(-4, -6)$.
70. Through the point $(-4, -6)$ and perpendicular to the line $y = -\frac{2}{3}x + 5$.

[Sec 10.8]

Perform the indicated operations. If the answer is complex, be sure to state it in $a + bi$ form.

71. $(2 + 5i) - (2 - 5i)$ 72. $\frac{6 + 3i}{6 - 3i}$

[Sec 5.1, 5.2, 5.3, 5.4, 5.5, 5.6]

Factor completely.

73. $4x^3 + 12x^2 - 9x - 27$ 74. $x^3 - y^3$

[Sec 2.3, 6.6, 10.7, 10.3]

Solve. (Show all checks.)

75. $\frac{4}{y} - \frac{5}{3} = \frac{-1}{5}$

76. $\frac{10}{x^2 - 25} = \frac{3}{x+5} + \frac{1}{x-5}$

77. $\sqrt{9 - 3x} = 9$

[Sec 2.4, 5.7, 6.6, 8.1, 8.2, 8.3, 9.1, 9.3, 9.4, 10.7, 11.1, 11.2, 11.3]

Check solutions of all the types of equations and inequalities covered. In particular, always check if rational and radical solutions are extraneous and any solution found by graphing. Check your solutions in all "solve" problems on this review.

78. True or false (show a reason): The solution to $\frac{x-7}{x-9} = \frac{2}{x-9}$ is $x = 9$.

[Sec 9.3, 9.4]

Solve.

79. $|3x - 5| - 2 = 11$

Solve. Graph solution set on a real number line. State it in interval notation.

80. $|5x - 3| \leq 18$

81. $|6x - 8| + 3 > 7$

82. $|5x + 3| < -6$

[Sec 10.2, 10.3, 10.4, 10.5, 10.6]

Use rational exponents to simplify each radical. Write each as a single radical expression. Assume that all variables represent positive real numbers.

83. $\sqrt[8]{4x^2}$

84. $\sqrt{5r} \cdot \sqrt[3]{s}$

[TI-82/83/84 work, p 41, p 50, p 63, p 73, p 198-199, p 209, p 231, p 252, p 271, p458, p478, p486, p490, p522-523, p659, p661, p662, p 703, p746, p770, p 478, p 846]85. Given the function: $f(x) = -2(x-2)^2 + 6$, do each of the following on a TI-82/83/84.a) Enter the function, $f(x)$, in a Y= line.b) Find the vertex via the 2nd-TRACE= CALC functions [state it as an ordered pair].c) Find the y-intercept via the 2nd-TRACE= CALC, 1:VALUE function [state it as an ordered pair].d) Find any x-intercepts via the 2nd-TRACE= CALC functions [state them as ordered pairs, rounded to the nearest three decimal places].

e) View the t-table.

f) Find the *domain* and *range* of $f(x)$. State each in interval notation.

g) If in a "lecture" or hybrid section, you may be asked to show your instructor the graph with any key point above displayed on your grapher.

86. Given the function: $f(x) = \sqrt{x+2} - 3$, do each of the following on a TI-82/83/84.

a) State your grapher model number (TI-82/83/84, etc.).

b) Enter the function, $f(x)$, in a Y= line.

c) View the t-table.

d) Find the end-point in the t-table [state it as an ordered pair].

e) Find the y-intercept via the 2nd-TRACE= CALC, 1:VALUE function [state it as an ordered pair, rounded to the nearest three decimal places].f) Find the x-intercept via the 2nd-TRACE= CALC functions [state it as an ordered pair].g) Find the *domain* and *range* of $f(x)$. State each in interval notation.

h) If in a "lecture" or hybrid section, you may be asked to show your instructor the graph with any of the above displayed on your grapher.

[Sec 6.1, 6.2, 6.3, 6.4, 6.5]

Perform the indicated operations and simplify if possible.

Simplify each.

87. $\frac{x^2 - 9}{x^2 - 3x} \div \frac{x^2 + 4x + 3}{2x + 10}$

88. $\frac{10}{x^2 - 9} - \frac{5}{x + 3}$

89. $\frac{z^2 - 5z}{z^2 - 25}$

90. $\frac{\frac{b}{a} - \frac{a}{b}}{\frac{1}{b} + \frac{1}{a}}$

In the less-likely category:

Graph a line given any point and the slope (7.1)

Solve dependent and inconsistent systems of linear equations in two variables. (8.1, 8.2, 8.3)

Other set concepts (union \cup of $\{ \}$, or; intersection \cap of $\{ \}$, and) (9.1)Simplifying powers of i (10.8)

Using the discriminant to determine the nature of solutions (11.2)

Solving problems which are quadratic in nature (using "U-substitution"). (11.3)

Solving maximum and minimum problems using quadratic functions. (11.5)